



College of Business  
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udies in Management and Accounting for the

# **FOREST PRODUCTS INDUSTRY**

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**CAPITAL BUDGETING PRACTICES OF THE  
FOREST PRODUCTS INDUSTRY - 1997**

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## Capital Budgeting Practices in the Forest Products Industry – 1997

### Introduction

The forest products industry – an industry composed of firms selling wood, pulp, paper, and packaging products – has always been capital intensive. This is because the long-term assets of firms operating in this industry consist primarily of timber holdings and substantial plant and equipment. As a result, the financial performance of forest products companies is strongly influenced by decisions regarding the acquisition and utilization of these capital resources.

In the past twenty years, significant changes have taken place in this industry. First, inflation has caused the cost of timber and timberland to rise to unprecedented levels. Secondly, environmental legislation has limited the supply of timber resources and impacted both the types of capital investments possible as well as the harvesting techniques.<sup>1</sup> In order to remain competitive, forest products companies have not only had to become more efficient in their manufacturing operations, they have also had to make economically sound, environmentally conscious, and socially acceptable decisions regarding their acquisition of timber, timberland, and other capital assets. Those firms that have not been able to meet the above challenges have either had to close down operations or they have been acquired by competitors. The net result has been a significant decline in the number of firms in the industry.

The process of analyzing investments in long-term assets is called capital budgeting. For forest product companies these investments typically fall into one of two categories – namely, equipment purchases and timberland purchases. In the case of equipment, the purchases may be undertaken for the purpose of replacing obsolete assets, expanding plant capacity, or reducing operating costs. Equipment decisions can also involve the choice between an outright purchase or a lease. The important characteristic of all these equipment purchase decisions is that the cash flows related to the equipment will occur over a number of years - beginning with an initial cash outflow followed by a series of net cash inflows. In the case of timber acquisition decisions, the total time horizon of the decision may easily exceed 20 years. For this reason alone, the methods used in analyzing capital investments should be concerned with the time value of money.

In 1977, the authors conducted a survey of forest products companies to investigate the following four areas:

- 1) the nature of the capital budget,
- 2) project evaluation techniques,
- 3) methods of risk analysis, and
- 4) post audit procedures.

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<sup>1</sup> Environmental issues will have an even greater impact on investment decisions in the Forest Products Industry after release of the EPA "cluster rules". These rules combine air and water regulations and seek to regulate the industry's processes as a whole instead of allowing statutes to be set separately. The industry will be expected to comply three years after the date of enactment.

Since the forest products industry has changed so much in the past twenty years, the authors felt it would be appropriate to once again look at the issue of capital budgeting practices within the industry. One of the purposes of this 1997 survey was to determine whether or not major changes have taken place in the degree to which sophisticated capital budgeting methodologies were being employed in this industry. The survey also looked at differences in evaluation techniques currently being utilized to evaluate timberland purchases and those purchases involving only plant and equipment. The survey also tried to identify other issues respondents mentioned as being important in the capital budgeting decision making process or new methodologies coming into use which could help firms deal with increasing pressures in the regulatory arena.

### Description of the Current Survey

The survey was sent to the Chief Financial Officers of 87 U.S. forest products companies. These companies consisted of all of the independent firms (i.e., separate divisions of a single parent company were not included) currently participating in the Oregon State University Forest Products Industry Monograph Program.<sup>2</sup> The survey questionnaire was completed by 29 firms representing a response rate of 33% - slightly lower than the 47% response rate received in the 1977 survey. Sixteen of these firms operated in the wood products side of the industry. There were only two firms operating exclusively in the pulp, paper, and packaging side of the industry, and the remaining eleven firms sold both wood and paper related products. This industry breakdown of firms was similar to the breakdown of firms responding in 1977.

The financial demographics of the respondents as of year-end 1996 are shown in Table 1. Although there are still a number of smaller forest products companies operating in the U.S., the largest percentage of firms (over 33%) had annual sales and total asset levels exceeding \$500 million. Such a finding was not surprising given the consolidation which has taken place within the industry in the past 20 years.

**Table 1 Distribution of Respondent Firms by Size**

<b>Annual Sales (in millions)</b>	<b>Number &amp; (%) of Firms</b>	<b>Total Assets (in millions)</b>	<b>Number &amp; (%) of Firms</b>
Less than \$50	5 (17%)	Less than \$50	8 (28%)
\$50 to \$100	6 (21%)	\$50 to \$100	4 (14%)
\$101 to \$500	6 (21%)	\$101 to \$500	7 (24%)
Over \$500	12 (41%)	Over \$500	10 (34%)
Total	29	Total	29

<sup>2</sup> In 1977, there were a total of 241 companies participating in the Oregon State University Forest Products Monograph Program.

The companies were also asked to report the dollar amount of their annual capital budgets for both timber related investments and plant and equipment. These results are shown in Table 2. As was the case in 1977, the annual capital budgets were found to be approximately 10% of total assets.

**Table 2: Size of Capital Budgets**

<b>Capital Budget (in millions)</b>	<b>Timber Investments</b>	<b>Other Capital Investments</b>	<b>Total Capital Investments</b>
Less than \$5	7 Companies	12 Companies	11 (38%) Companies
\$5 to \$10	5 Companies	1 Company	2 (7%) Companies
\$11 to \$50	4 Companies	6 Companies	6 (21%) Companies
Over \$50	2 Companies	9 Companies	10 (34%) Companies
Total	18 Companies	28 Companies	29 Companies

### Capital Budgeting Evaluation Methods

In order to determine the degree to which sophisticated capital budgeting methodologies were being utilized, the survey provided descriptions of the four major capital budgeting techniques most often used by financial analysts. These techniques included: accounting rate of return, payback period, internal rate of return, and net present value.<sup>3</sup> For each method, the company was asked to identify which of these methods were used in the capital budgeting decision making process and whether or not they were used as a primary evaluation technique, secondary evaluation technique, or only a project screening technique. This was done separately for timber related investment decisions and plant and equipment investment decisions. In addition, each company was asked to describe other formal evaluation techniques which they employed as well as other factors they considered relevant to the capital budgeting process.

#### Primary Evaluation Techniques

Table 3 shows the number and percentage of firms using each of the four methodologies as a primary evaluation technique to judge the acceptability of both timberland and plant and equipment purchases.<sup>4</sup> From this data, several interesting results emerge. First, a far greater percentage of firms use one of the discounted cash flow techniques in evaluating timber related investments (76%) than they do in the case of plant and equipment purchases (55%). These results are conceptually reasonable because the long life of timber related investments makes the time value of money particularly important. By the same token, fewer companies use payback period as a primary evaluation technique when making timber investment (15%) than in the case of plant and equipment purchases

<sup>3</sup> These descriptions are included in an appendix at the end of this monograph.

<sup>4</sup> In Table 3 and succeeding tables, respondents could select more than one evaluation technique in each category. As a result, the total responses may exceed the total number of firms responding to the survey.

(33%). Since the payback period is most useful as a short term screening technique, it should be less useful when looking at timber purchases.

**Table 3: Primary Evaluation Techniques**

<b>Capital Budgeting Technique</b>	<b>Timber Investments</b>	<b>Other Capital Investments</b>
Accounting Rate of Return	3 (9%) Companies	6 (13%) Companies
Payback Period	5 (15%) Companies	15 (33%) Companies
Internal Rate of Return	13 (38%) Companies	15 (33%) Companies
Net Present Value	13 (38%) Companies	10 (22%) Companies
Total	34 Companies	46 Companies

The most significant finding, however, is the fact that the discounted cash flow techniques of internal rate of return and net present value, are much more widely used today as a primary evaluation technique than they were in 1977 when they were used by less than half (only 44%) of the forest products companies. Furthermore, in 1977, several of the smaller companies reported that they only used subjective judgement in making capital budgeting decisions. Only one of the smaller companies in the current survey relied solely on subjective judgement.

#### Secondary Evaluation Techniques

Table 4 shows the number and percentage of firms using each of the four methodologies as their secondary evaluation technique. In comparison to the 1977 survey, not much has changed. The payback period is still the dominate secondary technique although it is more widely used for plant and equipment decisions than for timber investments. In addition, the accounting rate of return is used substantially more as a secondary evaluation technique than as a primary evaluation technique for all types of investment decisions.

**Table 4: Secondary Evaluation Techniques**

<b>Capital Budgeting Technique</b>	<b>Timber Investments</b>	<b>Other Capital Investments</b>
Accounting Rate of Return	5 (23%) Companies	6 (22%) Companies
Payback Period	8 (36%) Companies	13 (48%) Companies
Internal Rate of Return	5 (23%) Companies	3 (11%) Companies
Net Present Value	4 (18%) Companies	5 (19%) Companies
Total	22 Companies	27 Companies

While arguments can be made that neither the accounting rate of return nor payback methods consider the time value of money and the economic impact which this has on the market value of the firm, both of these methodologies have some redeeming features. Both are intuitive and easy to understand. Both are easy to calculate. In the case of the payback period, the focus is on liquidity which is clearly an important issue for a capital intensive firm. Moreover, accounting information is almost always available for the project under consideration and for the firm as a whole. Thus, the calculation of accounting rate of return is a normal by-product of the companies financial accounting information systems.

### Project Screening Techniques

The survey in 1977 did not ask about the use of any of these four methodologies as screening techniques in the capital budgeting process. These results are shown in Table 5. This table shows once again the emphasis forest products firms place on the discounted cash flow methodologies in evaluating timber investments. Seventy percent of the firms find these techniques useful even at the project screening stage. On the other hand, payback is the most commonly used screening technique for investments in plant and equipment.

**Table 5: Project Screening Techniques**

<b>Capital Budgeting Technique</b>	<b>Timber Investments</b>	<b>Other Capital Investments</b>
Accounting Rate of Return	1 (6%) Company	4 (15%) Companies
Payback Period	4 (24%) Companies	11 (42%) Companies
Internal Rate of Return	6 (35%) Companies	8 (31%) Companies
Net Present Value	6 (35%) Companies	3 (12%) Companies
Total	17 Companies	26 Companies

### Company Size and Evaluation Techniques

In looking at the size of the forest products companies in relationship to the type of evaluation techniques, we see that size is still the dominate factor when it comes to using discounted cash flow analysis in analyzing anything other than timber investments. These results are shown in Tables 6 and 7. For timber investments, even the smaller companies favor the discounted cash flow techniques. On the other hand, in plant and equipment decisions, the combined accounting rate of return and payback method responses equaled or exceeded the discounted cash flow responses in all firms whose sales were less than \$500 million.

**Table 6: Primary Evaluation Techniques Based on Company Sales:  
Timber Investments**

Annual Sales (in millions)	Number of Companies			
	ARR	PB	IRR	NPV
Less than \$50 (2 companies)	-	-	1	1
\$50 to \$100 (3 companies)	1	2	-	1
\$101 to \$500 (6 companies)	1	2	4	3
Over \$500 (10 companies)	-	-	8	8

**Table 7: Primary Evaluation Techniques Based on Company Sales:  
Other Capital Investments**

Annual Sales (in millions)	Number of Companies			
	ARR	PB	IRR	NPV
Less than \$50 (4 companies) <sup>5</sup>	-	1	1	-
\$50 to \$100 (6 companies)	3	5	1	1
\$101 to \$500 (6 companies)	-	4	3	1
Over \$500 (12 companies)	2	5	10	8

It is also interesting to note that none of the largest forest products firms used either accounting rate of return or payback when evaluating timber purchases, and only two out of the twelve largest firms used accounting rate of return when evaluating plant and equipment. The shares of many of these firms are public-owned, so it is not surprising that investment decisions tend to be market driven. Since book value and net income do not have much to do with cash flow and market value, accounting rate of return measures do not tell the managers of these public-owned firms what they really need to know.

#### Other Factors Relevant to the Capital Budgeting Decision

In reviewing the comments which were received from respondents regarding capital budgeting decisions, two conclusions emerged. In the case of timber investments, the

<sup>5</sup> Two of these firms relied on subjective judgement.



most important issue centered on strategic wood supply considerations – namely, current availability, expected acquisition cost, location, age, and class of timber, as well as what was likely to happen to any of these factors in the future. To firms selling wood, pulp, paper, or packaging products, this issue of availability is of prime importance. To remain in business, firms need an ongoing supply of timber. As a result, financial analysis techniques which emphasize the accounting concepts of breakeven analysis and shutdown costs are getting increased attention by forest products firms.

On the plant and equipment side, it was not surprising to learn that one of the most important issues has become the need to comply with the regulatory standards concerning health, safety, and the environment. With more and more of these types of pressures likely in the future and with the dollar cost of failing to satisfying these concerns rising, traditional financial analysis may very well become a secondary criteria used to evaluate investment options. Two companies also mentioned the importance of the custodial role they feel forest products companies have with regard to maintaining the timber resource and the overall welfare of their employees.

#### Risk Adjustment Methodologies

An extended time horizon is implicit in all capital projects. This is particularly true in timber acquisition projects. This increases the difficulty of accurately forecasting the future costs and returns in these projects. For this reason, risk is an important concern in capital budgeting. Traditionally, there have been three common quantitative methods of adjusting capital projects for risk. The first technique is to raise the cost of capital used as a cut off rate or used in discounting future cash flows in the net present value methodology. The second technique is to adjust the project life downward. The third approach involves the use of sensitivity analysis where a range of future expectations are considered in the project analysis. In particular, the projected costs can be increased, and/or the projected benefits can be decreased. This approach can determine the extent to which the actual costs and benefits could deviate from the most likely estimate before an acceptable project would become unacceptable.

In 1977 only 44% of the respondent companies reported using one of these three quantitative risk adjustment techniques. Moreover, the majority of the companies used the sensitivity analysis approach. In the 1997 survey, the percentage of companies using formal risk adjustment had risen to 76% (22 of the 29 firms). Only 17% (5 firms) reported that they do not adjust for risk at all in evaluating capital budgeting decisions. The remaining 7% (2 firms) attempted to consider risk subjectively. These results support the finding noted earlier that forest products companies are becoming more sophisticated in their capital budgeting methodologies.

Table 8 shows the number of firms using each of these three quantitative techniques. The results are reported for both timber purchases as well as plant and equipment. Table 9 presents the results based on firm size.

**Table 8: Type of Risk Adjustment Used**

<b>Risk Adjustment Method</b>	<b>Timber Investments</b>	<b>Other Capital Investments</b>
Raise Cost of Capital	8 companies	8 companies
Adjust Life Downwards	3 companies	6 companies
Sensitivity Analysis	15 companies	19 companies
Other	4 companies	4 companies

**Table 9: Primary Risk Evaluation Technique Based on Company Sales**

<b>Annual Sales (in millions)</b>	<b>Number of Firms</b>			
	<b>Raise Cost of Capital</b>	<b>Adjust Life Downward</b>	<b>Sensitivity Analysis</b>	<b>Other</b>
Less than \$50 (2 firms)	2	-	2	-
\$50 to \$100 (4 firms)	1	1	3	-
\$101 to \$500 (4 firms)	-	2	4	2
Over \$500 (12 firms)	8	5	11	3

While sensitivity analysis continues to be the risk adjustment technique of preference for all size categories of firms, and there does not appear to be much difference in the type of risk adjustment technique used in analyzing timber and non-timber investments, some of the larger forest products firms are beginning to use other methods to analyze risk. Some of these techniques include the use of formal probability analysis in which firms actually attempt to calculate the probability of investments earning a return greater than the firms cost of capital or earning a positive net present value, and less formal methods such as shortening the payback period and reducing the amount initially invested for projects involving higher risk. Furthermore, one company reported using a decision tree approach in evaluating plant and equipment purchases. Under this technique, a firm would attempt to lay out several different scenarios, assign probabilities to each scenario, and then calculate expected profitability measures based on either the firm's cash flow or accounting net income. This latter techniques would appear to be particularly relevant in the case of changing regulatory environments or widely fluctuating timber prices noted earlier. (We will discuss this technique further in the recommendation section of the monograph.)

### Post Audit Procedures

It is generally recommended that companies should conduct a post audit to compare the actual results of a capital project with the original forecasts that were used in determining that the project was acceptable. This not only can serve as an evaluation of project implementation, but also as an evaluation of the entire capital budget planning process. Companies can use this information to evaluate the accuracy of their forecasts and whether they have been using the appropriate project analysis techniques. In 1977, two thirds of the forest products companies conducted some form of formal post audit of their capital projects. In the 1997 survey, over three quarters are reporting that they do post audits of their capital investment projects.

Table 10 shows the 1997 data concerning the use of post audits for capital investment projects. As can be seen in this table, all 12 of the largest companies in the survey do use post audits for their capital projects as do most of the firms in the \$50 - \$100 million and \$101 - \$500 million categories. In fact, post audits seem to be the general practice in all but the smallest companies where only one of the respondent firms has a post audit procedure in place.

**Table 10: Post Auditing for Capital Investment Projects**

Annual Sales (in millions)	Number of Companies	
	Post Audit	No Post Audit
Less than \$50	1	4
\$50 to \$100	4	2
\$101 to \$500	5	1
Over \$500	12	0
Total	22	7

In reviewing the comments made in connection with post auditing procedures, several interesting observations are in order. First, post audits were typically conducted between 6 months to one year after projects were fully operational. Second, in most cases, post audits were mandatory on all large projects (i.e., over \$5 million) with the results being reported to the board. Conducting post audits on smaller projects was typically at the discretion of the audit committee, company president, or business unit vice president depending on the size of the firm involved. Third, most firms conducted post audits on only the first year results; with one firm reporting that they audited up to five years results in the case of very large investments.

The most interesting comment received regarding post audits was the following:<sup>6</sup>

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<sup>6</sup> Selected portions of this comment were deleted to protect the identity of the respondent.

"We pick a finance person and a manufacturing person from a different plant/mill to act as a team to perform the audit. They are given a copy of the project and all backup information and are given three to four months to complete the audit, while continuing with all their normal job requirements. They prepare the audit report and then give a presentation to our audit committee. Normally, only larger projects are post audited. All other financially justified projects are reviewed in a less formal process. These reports are completed by the responsible plant/mill and routed around for review."

The fact that this firm used individuals from both finance and manufacturing in addition to requiring that they be from a different operating unit, increases the likelihood that the post audit results for the major investments would be unbiased.

### Conclusions

On the basis of the survey, the following conclusions can be made regarding capital budgeting practices in the forest products industry in the last twenty years. First, there has been a significant increase in the use of the more sophisticated and theoretically preferred discounted cash flow methodologies of internal rate of return and net present value for all capital investment decisions. While firm size continues to be the dominate factor when it comes to the use of these methods in evaluating plant and equipment purchases, even smaller firms use them in the case of timber investments. Moreover, a greater percentage of firms are now applying discounted cash flow techniques in the preliminary or project screening stages of their capital budgeting process.

Second, risk analysis has taken on increased importance. A greater percentage of firms are using quantitative techniques and those that do not, at least attempt to consider risk subjectively.

Third, only smaller firms have failed to implement post audit procedures on a consistent basis as a way to both monitor and control their major capital investments. Post audit procedures in medium and large firms are not only becoming more formal in terms of reporting requirements, they are also more extensive in terms of the actual analysis procedures being employed.

Fourth, other procedures such as breakeven analysis, probability analysis, and decision trees are coming into use as relevant capital budgeting methodologies. In addition, non-economic issues are taking on a greater degree of importance in the decision making process. The issue most often cited is the changing regulatory climate in the forest products industry especially as it relates to health, safety and the environment. Each of these areas relate to the firm's custodial role concerning both timber resources and employees.

## Recommendations

Twenty years ago our recommendations regarding capital budgeting procedures addressed three basic issues – namely, the need to develop more formal capital budgeting procedures with objective evaluation criteria, the need to consider how risk can affect project results, and the need to implement formal post audit procedures. This survey has found that significant progress has been made in all three of these areas as firms in the industry have grown. Since many respondents mentioned the importance of regulatory issues in their capital budgeting decisions today, our current recommendations section will focus on an analytical technique which forest products firms may be able to use in dealing with potential changes in this arena. This technique is known as Decision Tree Analysis and was mentioned earlier as a risk analysis technique currently being used by one of the survey respondents. A simple illustration of the methodology, a brief discussion of its pros and cons, and a concluding comment follows.

### Decision Tree Analysis – An Illustration<sup>7</sup>

One area of particular concern to decision makers in the forest products industry is their current and future situation with regard to timber supply. There is always the possibility that new environmental regulations designed to protect habitat for an endangered species can reduce the supply of timber that is available for harvest. A decision tree approach allows decision makers to look at how alternative regulatory scenarios in this case can affect the possible outcomes of a timber investment decision.

**The Illustration.** Assume Wood Products Company is currently considering the purchase of timberland that would provide a future source of timber supply for the company's operations over the next 10 years. Based on current environmental regulations, the company has forecasted present values using the most likely future cash flows. These values are shown in Table 11. The current cost of buying the timberland is \$5 million. The most likely present value of buying the timber as needed is also calculated to be \$5 million. (For simplicity, this assumes that purchase cost increases exactly offset the discount rate.) The future cash flows from using the timber are estimated to have a most likely present value of \$6 million regardless of whether the company buys the timberland today or waits to purchase its timber as needed over the next 10 years. This means there is a \$1 million net present value of either buying the timberland now or buying the timber as needed. In other words, from a financial standpoint, the two alternative timber acquisition strategies would be equal.

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<sup>7</sup> For a detailed discussion of the use of decision trees in capital budgeting see J. Fred Weston and Thomas E. Copeland, Managerial Finance, 9<sup>th</sup> edition, The Dryden Press, 1992, pp. 473-515.

**Table 11: Net Present Values of Timber Acquisition Alternatives  
Where the Analysis Uses the Most Likely Cash Flows  
to Calculate Present Values**

	<b>Present Value of Timber Cost</b>	<b>Present Value of Using Timber</b>	<b>Net Present Value</b>
Buy Timber Now	\$5 Million	\$6 million	\$1 million
Buy Timber as Needed	\$5 Million	\$6 million	\$1 million

However, now suppose that the company believes there is only a 60% chance that the environmental regulations effecting timber supply will remain unchanged. Furthermore, assume the company believes there is a 30% chance that these regulations will become stricter during the next 10 years and only a 10% chance that these regulations will be relaxed. This one area of uncertainty leads to three possible projected outcomes for the project instead of only one.

A decision tree is a way of diagramming this type of uncertainty so that each branch of the diagram represents one of the possible scenarios. Figure 1 shows the decision tree diagram for the above example. The data shown in this diagram are taken from Table 12 and Table 13. These data reflect the expectation that increased environmental regulation would reduce the available supply of timber, and reduced environmental regulation would increase the available supply of timber. A reduction in timber supply should cause an increase in both the present value of future cash flows from using the timber (due to higher sales prices), and an increase in the present value of the cost of purchasing the timber as needed. (Of course, it is not necessary that the selling price and buying cost would change equally.) Increases in the timber supply should have the opposite effects.

**Table 12: Present Value Expectations Based on Three Environmental  
Regulatory Scenarios**

<b>Level of Environmental Regulation</b>	<b>Probability</b>	<b>Present Value of Using Timber</b>	<b>Present Value Cost of Buying Timber as Needed</b>	<b>Present Value Cost of Buying Timber Now</b>
Increased Regulation	30%	\$6.5 million	\$7.0 million	\$5.0 million
Current Regulation	60%	\$6.0 million	\$5.0 million	\$5.0 million
Decreased Regulation	10%	\$4.5 million	\$3.0 million	\$5.0 million

**Table 13: Net Present Values of Timber Acquisition Strategies Based on Three Environmental Regulatory Scenarios**

<b>Level of Environmental Regulation</b>	<b>Probability</b>	<b>Net Present Value of Buying Timber as Needed</b>	<b>Net Present Value of Buying Timber Now</b>
Increased Regulation	30%	(\$0.5 million)	\$1.5 million
Current Regulation	60%	\$1.0 million	\$1.0 million
Decreased Regulation	10%	\$1.5 million	(\$0.5 million)
Expected Value		\$0.6 million	\$1.0 million

The decision tree diagram shows that the expected value of the timberland purchase is \$1.0 million compared to an expected value of only \$0.6 million from buying the timber as needed. If Wood Products Company wants to maximize expected value, it should purchase the timberland now. On the other hand, a closer look at the decision tree shows that both decision alternatives offer a range of possible outcomes depending upon the level of environmental regulation.

If there is increased regulation, purchasing the timberland now would provide the company with a \$1.5 million positive NPV compared to a \$0.5 million negative NPV of buying the timber as needed over the 10 years. The net result would be a \$2 million advantage for purchasing the timberland now. However, if environmental regulation is decreased, the strategy of waiting to buy the timber would have the \$2.0 million net advantage. Only if current environmental regulations continue unchanged, would the two alternatives have the same net present value.

#### Decision Tree Analysis – Some Pros and Cons

The above example has been simplified to illustrate the potential use of decision tree analysis as a way of dealing with uncertainty. In an actual project analysis, managers will be concerned about several areas of uncertainty at the same time (e.g., environmental regulation, general inflation, strength of the economy, and export demand). Each area of uncertainty will increase the complexity of the decision tree analysis by adding another series of branches to the diagram and another dimension to the tables. If no attempt is made to control the number of possible future events, decision trees can expand to the point that the analysis becomes overwhelming for even the most sophisticated manager.

On the other hand, the strength of decision trees is that they allow the explicit analysis of possible future events and decisions. By displaying the links between today's and tomorrow's decisions, they provide additional insight into the decision making process

and enable managers to make more rational decisions today. Their value should not be judged on their completeness or comprehensiveness, but rather on whether they show the most important links between current and future decisions.

### Concluding Comment

Historically, success in the forest products industry has been measured on the basis of the “bottom line”. Has the firm been able to produce the financial results required by its investors? As the number of stakeholders has increased, the “litmus test” has changed. No longer is it possible for the firm to ignore its environmental and social responsibilities in the pursuit of bottom line results.<sup>8</sup>

In concluding this monograph, it must be pointed out that these three measures of performance – namely, financial, environmental, and social - are not mutually exclusive or necessarily in conflict. Rather, the majority of “world class” companies today view them as being interdependent.

Capital budgeting methodologies such as Decision Tree Analysis, while not always ideal or easy to implement, at least provide a framework in which to formally address these issues. Our recommendation is that forest products firms thoroughly investigate and begin to implement this and similar procedures in their capital budgeting processes. Their long run success will depend on it.

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<sup>8</sup> For a through discussion of the changing nature of the forest products industry see Jean Mater, Reinventing the Forest Industry, Green Tree Press, Wilsonville, Oregon, 1997.



## Appendix

### Definitions of Capital Budgeting Techniques

#### Accounting Rate of Return

This is an income based method that calculates a percentage rate of return by dividing the forecasted average net income over the life of the project by the average amount of the capital investment. The accounting rate of return can also be determined by dividing the forecasted average net income over the life of the project by the initial capital investment.

#### Payback Period

This is a cash flow based method that calculates the number of years required for the forecasted project cash flows to recover the capital investment.

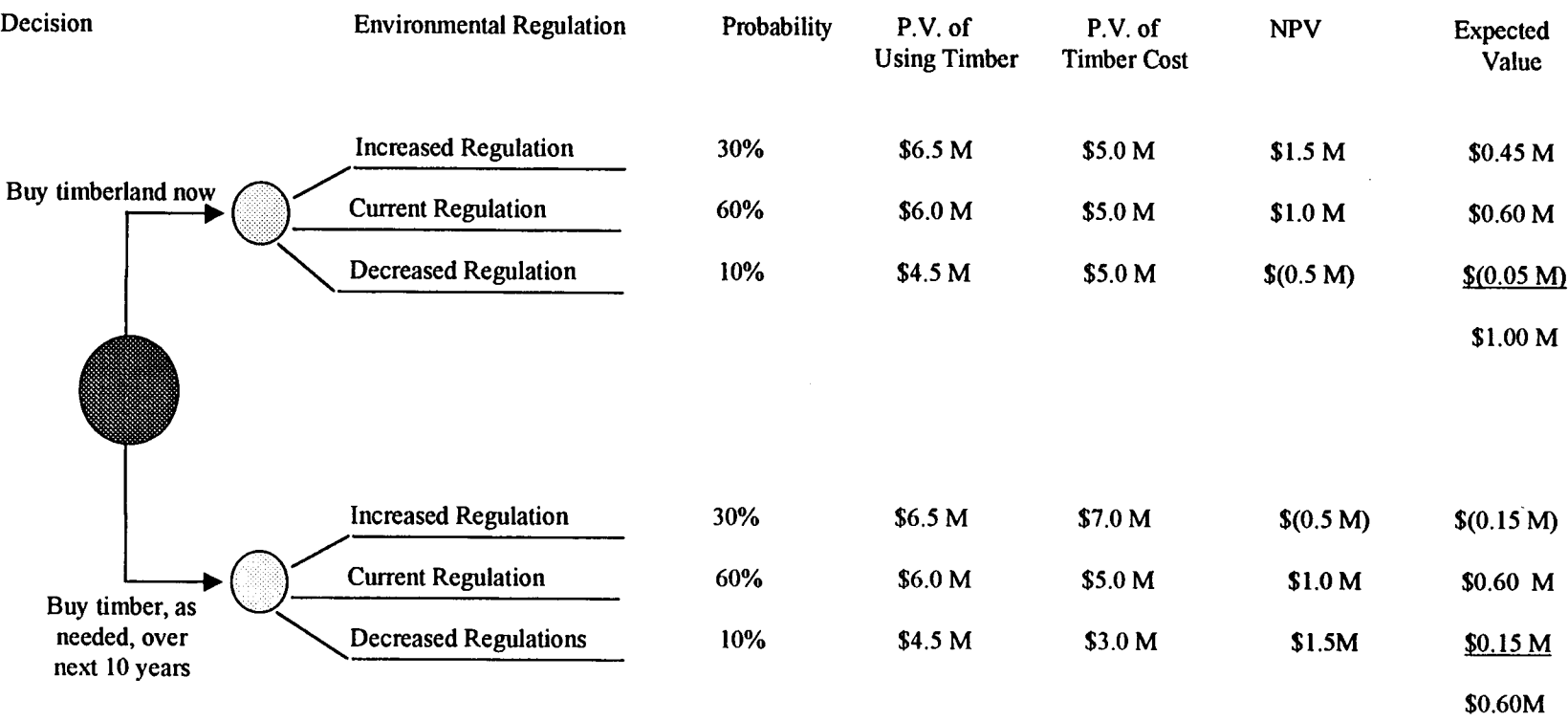
#### Internal Rate of Return

This is a cash flow based method that calculates the discounted rate of return that will equate the present value of the forecasted project cash flows over the life of the project with the capital investment required for the project.

#### Net Present Value

This is a cash flow based method that uses a required rate of return (i.e., the firm's cost of capital) to discount all of the forecasted future cash flows for a project. These discounted cash flows are compared to the initial capital investment to determine whether the project has a positive or negative net present value.

FIGURE 1 Illustrative Decision Tree



# STUDIES IN MANAGEMENT AND ACCOUNTING IN THE FOREST PRODUCTS INDUSTRY

Oregon State University

<u>No.</u>	<u>Monograph Title</u>
*1	"The Rush to LIFO: Is It Always Good for Wood Products Firms?" (1976).
*2	"Accounting and Financial Management in the Forest Products Industries: A Guide to the Published Literature," (1977 and 1981).
3	"A Decision Framework for Trading Lumber Futures," (October 1975).
4	"Capital Gains Tax Treatment in the Forest Products Industries," (June 1976).
5	"Measurement Difficulties in the Log Conversion Process," (June 1976).
6	"Capital Budgeting Practices in the Forest Products Industry," (March 1978).
7	"A Reporting and Control System for Wood Products Futures Trading Activities," (July 1978).
8	"Selected Issues of Financial Accounting and Reporting for Timber," (November 1978).
9	"Pool Log Transfer System," (August 1979)
10	"Fundamentals of Financial Major Timber Acquisitions," (February 1980)
11	"LIFO Inventories in the Forest Products Industry," (July 1980).
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